REMARKS/ARGUMENTS

In response to the Office Action mailed December 15, 2005, Applicants amend their application and request reconsideration. In this Amendment claims 1-4 are cancelled and claim 9 is added so that claims 5-9 are now pending.

The specification is amended to conform the specification to more conventional United States format.

Because of the similarity of claims 1-4 to claims 5-8, claims 1-4 are cancelled. However, no claimed subject matter is surrendered by this cancellation.

The invention concerns a method of making a semiconductor device that includes a polycrystalline silicon film that has been converted from an amorphous silicon film. Figures 1-5 particularly pertain to the invention as described in the claims now presented. The process illustrated in these figures is briefly described in the patent application from page 6, line 13 through page 7, line 13. However, the other figures and further description of the patent application supplement that initial disclosure. In summary, an amorphous silicon film 2, in the embodiment of the invention illustrated in those figures, is deposited on a substrate 1. Thereafter, by employing a laser light beam as very generally and schematically illustrated in Figure 2, that film is converted into a polycrystalline silicon film. As explained in the patent application, the wavelength of the light employed in that crystallization process is particularly important because light in the specified wavelength range is not well absorbed in the amorphous silicon film. Laser light within the desired wavelength range may be produced as a harmonic of light generated by a Nd:YAG laser. After the conversion of the film to polycrystalline silicon, as shown in Figure 3, the polycrystalline silicon film 3 is patterned. The patterning is conventional, for example using a photolithographic mask and etching.

Following the patterning, the remaining polycrystalline silicon film 3 is oxidized so that it is covered by an oxide film 5. The conditions for generating this oxide film are important in order to produce a film of desired quality and to protect the interface between the oxide film and the polycrystalline film. The thickness of the oxide film may be enhanced, after the oxidizing process in a saturated water vapor ambient, by depositing

an oxide film in a chemical vapor deposition process. Thereafter, retaining the oxide film in place, a gate electrode 6 is deposited on the oxide film opposite the polycrystalline silicon film as shown in Figure 5 of the patent application. As further explained in the patent application, the resulting structure can be completed as a field effect transistor having substantially improved electrical characteristics. The improved characteristics result from the orientation of the polycrystalline silicon grains along a direction between the source and drain of that transistor and the maintenance of a clean surface between the polycrystalline silicon and the oxide film.

In this Amendment claim 5 has been somewhat rearranged, without a change in scope by specifying in one paragraph the wavelength of the laser light employed and the conversion of the amorphous silicon film into a polycrystalline film. Further, the paragraph concerning oxidizing includes the conditions for oxidizing that previously appeared elsewhere within claim 5. In addition, claim 5 is amended, consistent with the disclosure of the patent application, for example with respect to the step illustrated in the embodiment of Figure 5, to describe the formation of a gate electrode on the oxide film. Claim 6 is amended for clarity. The silicon oxide film deposited by chemical vapor deposition is not deposited directly on the polycrystalline silicon film but on the oxide film. New claim 9 describes the patterning of the polycrystalline silicon film as illustrated in the step of Figure 3 of the patent application.

Claims 5, 7, and 8 were rejected as unpatentable over Ogawa et al. (U.S. Patent 6,566,683, hereinafter Ogawa) in view of Funai et al. (U.S. Patent 5,550,070, hereinafter Funai). This rejection is respectfully traversed as to the claims presented here.

Applicants do not quarrel with the Examiner's description of Ogawa. Further, Applicants agree that Funai describes oxidizing the surface of a polysilicon film in an atmosphere including oxygen after the polycrystalline silicon film has been produced from an amorphous silicon film by irradiation with light. Applicants do not agree that there is disclosure within Funai that the ambient in which the oxidation occurs is a saturated water vapor ambient at a pressure of at least 10 atmospheres. The portion of Funai to which the Examiner directed attention only describes oxidizing the crystalline silicon film in an annealing furnace in a water vapor ambient in a temperature range

within the range specified in claim 5. It is unclear from Funai whether the quartz tube in which the crystalline silicon film is present is open or closed and whether it is even possible to obtain the pressure or the saturated water vapor ambient described in the claimed invention. The patent application makes clear that these conditions are highly important in achieving the desired result, namely improved electrical characteristics, for example, reduced voltage threshold in a transistor employing the film produced according to the method. On that ground, the rejection of the claims presented for examination was deficient because all of the elements of the claimed invention are not described in the prior art.

In Funai, the purpose of depositing the silicon oxide film 111 is to assist in gettering nickel that is purposely incorporated in the silicon film to aid in the formation of grains of the polycrystalline silicon. See Funai at column 9, lines 30-41. Further, the oxide film assists in collecting organic substances that remain on the surface of the crystalline silicon film. In order to complete the gettering process in Funai, it is essential that the silicon oxide film 111 be removed before employing the polycrystalline silicon film 112 in a process of manufacturing a thin film transistor. Every example of Funai requires the removal of the silicon oxide film before undertaking further steps in the manufacture of a transistor, for example, as described in that same column 9, lines 45-63.

The invention as described by claims 5-9 is substantially different from and contrary to any teaching that might be derived from modifying Ogawa with Funai. Of course, Ogawa does not describe the use of nickel to aid in the crystallization of amorphous silicon film. Second, even if the disclosure of Funai were employed to modify Ogawa, the result would be a teaching that after oxidizing the polycrystalline silicon film, the oxide would have to be removed before continuing the process of manufacturing a transistor. Claim 5, as presented here, makes clear that that original oxide film remains on the polycrystalline silicon film and is employed in the semiconductor device that is manufactured. Accordingly, *prima facie* obviousness of claims 5-9 cannot be established by the asserted modification of Ogawa with Funai.

Claim 6 was rejected as unpatentable over Ogawa in view of Funai and further in view of Clementi et al. (U.S. Patent 6,248,630, hereinafter Clementi). This rejection is respectfully traversed.

Clementi was cited as disclosing the deposition of a silicon oxide film on an oxidized surface of a polycrystalline silicon film using a chemical vapor deposition process. As acknowledged by the Examiner, this representation of what is disclosed in Clementi is, at best, inconsistent with the Clementi disclosure. Clementi never describes oxidizing a polycrystalline silicon film and, thereafter, depositing a silicon oxide by chemical vapor deposition. Rather, Clementi describes the removal of the remnants of a photolithographic mask with HF that, as known in the art, also removes oxides of silicon. This step exposes, but does not damage, an underlying silicon nitride film in Clementi. Thereafter, an oxide film is deposited by chemical vapor deposition, followed by an oxidizing process to increase the thickness of that oxide film. These two steps, as conceded by the Examiner, are directly opposite in sequence from the invention as described in claim 6.

The Examiner's dismissal of the difference in sequence between the steps of the invention according to claim 6 and Clementi is too facile. As described in the present patent application, the formation of the oxide film by oxidizing the silicon is essential to maintain a clean interface between the oxide film and the underlying polycrystalline silicon film. That problem is not presented in Clementi where there is a protective film of silicon nitride, not affected in the etching step, that provides protection to the underlying polycrystalline silicon film. The present patent application makes clear that the oxidizing step must precede any chemical vapor deposition step because the same cleanliness is not achieved and the same improved electrical characteristics are not produced if chemical vapor deposition is used to deposit an oxide film, rather than directly oxidizing the polycrystalline silicon film. For that reason, the rejection of claim 6 is erroneous.

In addition, because *prima facie* obviousness has not been demonstrated with respect to claim 5 and Clementi does not include pertinent disclosure that would suggest modification of Ogawa and Funai to produce the invention as defined by claim 6, the rejection of claim 6 cannot properly be maintained.

For the foregoing reasons, claims 5-9, as now presented, are patentable so that, upon reconsideration, those claims should be allowed.

Respectfully submitted,

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